



Earth Day will have to be extended to Earth Year, Decade, Generation if the poisoning of water, air, and soil is to be halted or even appreciably slowed down.

Eric Sevareid
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Forum

Mission to Planet Earth

Stark images of earth from 135 miles away can help health officials in Mexico pinpoint outbreaks of malaria before they occur, distinguish deadly oil spills from the viscous sheen produced by plankton, and warn people when the crops they eat might contain radiation. These are but a few of the actual and expected pay-offs from the recent shuttle flights run by the National Aeronautics and Space Administration (NASA) under the rubric of Mission to Planet Earth (MTPE).

The mission is a campaign to study the earth as a global environmental system that will continue into the 21st century. Some of the program's signature flights last year are yielding tangible results for scientists interested in the relationship between environmental change and human health, said Robert Harris, director of the science division of MTPE at NASA headquarters in Washington.

"We need to devote most of 1995 to analyzing mountains of data from highly successful MTPE shuttle flights in 1994," said Harris, who thinks the latest MTPE data can impress Congress and the public into supporting the revamped, streamlined program. Harris points, for example, to data

from two 10-day shuttle flights in April and October that revealed the earth as it might be seen without vegetation and scoured its lower atmosphere for evidence of deterioration. The flights, called Space Radar Laboratory I and II, featured two MTPE instruments: the U.S.-German-Italian Spaceborne Imaging Radar-C/X-Band Synthetic Aperture Radar (SIR-C/X-SAR), and a device known as MAPS (Measurement of Air Pollution from Space).

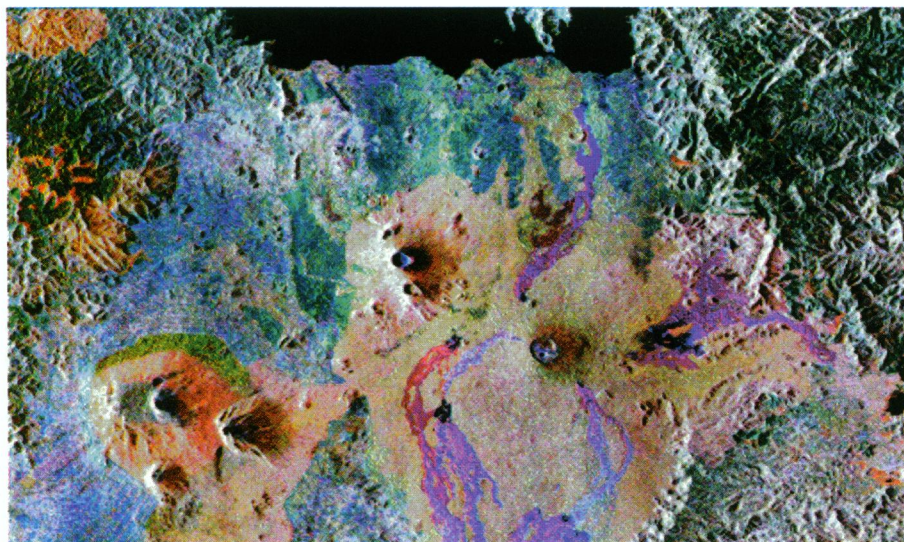
The \$400 million radar, the most sophisticated of its kind, has the ability to make measurements of the globe over virtually any region at any time, regardless of weather conditions. It can "see" through vegetation cover to map the earth's crust, oceans, and watersheds. "Our main goal is to monitor the earth's health and see how it is doing," said the project's chief scientist, Diane Evans, of the Jet Propulsion Laboratory. The radar can forecast natural disasters by tracking pools of water that form in depressions on a volcano's slope, and can pick out natural pollutants, like algae scum, from man-made hazards like oil spills. It can trace environmental disasters, such as damage to wetlands left by the Chernobyl nuclear power plant explosion.

The data can even predict the outbreak

of some diseases, said Evans. University of California at Fresno Professor Jack Paris uses radar data to develop models to predict when stagnant water will produce mosquitoes that carry malaria. So far, he and other researchers have forecast conditions in both Belize and on Mexico's Yucatan Peninsula that produced outbreaks. Such information can also be used to predict outbreaks of yellow fever and snail-borne schistosomiasis, a parasitic infection that is a major health problem in Asia, Africa, and South America. "It's an incredibly useful resource for developing countries," Paris said.

The MAPS instrument measures the global distribution of carbon monoxide in the lower atmosphere. Measuring carbon monoxide indicates how well the atmosphere can cleanse itself of greenhouse gases that can increase the atmosphere's temperature, said project scientist Vicky Connors, of NASA's Langley Research Center. It also assesses loss of ozone protection against ultraviolet radiation, she said. "If ozone is depleted, as we see it can be in the southern hemisphere, UV increases can result in increased skin cancer, but also in DNA damage in crop plants—a very compelling concern." New data released by NASA in December and again in January confirms that the atmosphere is slowly warming and that seas are rising one-tenth of an inch each year. The findings combine Space Radar Laboratory flights data with other information, including information from a third MTPE shuttle flight last year, the Atmospheric Laboratory for Applications and Science (ATLAS).

So far, the MAPS instrument is slated to fly on a satellite in two years, said Harris, but the future of SIR-C/X-SAR is uncertain. It will have to compete with other MTPE instruments vying to fly on a small platform in 1998. Although NASA spent \$1.2 billion on the MTPE last year and is expected to spend another \$1.3 billion this year, its scope has been considerably scaled down. Now, instead of grand space platforms from which arrays of instruments would fly by the year 2000, smaller, cheaper platforms are being designed to appeal to Congress, which



Eye in the Sky. NASA radar images of the Virunga volcano chain along the borders of Zaire, Rwanda, and Uganda help scientists tell if the vegetation will support the world's last 650 mountain gorillas and if eruptions may threaten area villages.

slashed the initiative three times this decade—from \$17 billion to \$7.5 billion—saying it was too risky and unjustifiably expensive. Harris is worried it will happen again: “Any more cuts and we will drastically reduce our objectives and probably lose some international partners who are helping us fund it now.”

Decline in Pesticide Use by Canadian Farmers

Farmers in Ontario are spraying smaller amounts of pesticides on their crops than in the past. From 1983 to 1993, pesticide use dropped by a dramatic 28.3%, according to the Ontario Ministry of Agriculture, Food, and Rural Affairs (OMAFRA). By comparison, pesticide use in the United States fell 15% between 1982 and 1992. Under the Food Systems 2002 project, OMAFRA has worked with farmers and agricultural and environmental groups since 1987 to cut pesticide use in half by the year 2002.

Declining North American pesticide use resulted, in part, from the application of environmentally “safer” chemicals, although greater amounts of such chemicals might be necessary to achieve the same effect. Today, Ontario farmers use one-third as much atrazine on corn crops to control quackgrass as they did 10 years ago. This one million kilogram decrease represents nearly half of Ontario’s total reduction in pesticide use. Many Ontario growers, concerned about atrazine’s environmental persistence, eliminated fall applications. On many farms, newer, short-lived herbicides, sprayed at rates of grams per acre rather than kilograms per acre, have replaced atrazine, said Ken Hough of the Ontario Corn Producers Association. There is evidence of a similar trend in the United States, where reduced herbicide use accounts for over 60% of the total decline in pesticide use.

In the early 1980s, the farming community’s rising concern about escalating pesticide applications prompted the Ontario government to support lower pesticide use, said Jeff Wilson, chairman of AGCare (Agricultural Groups Concerned About Resources and the Environment), which represents 45,000 growers in Ontario. “It was an evolutionary process, beginning with initiatives from growers,” said Wilson, “without a Big Brother or heavy-hand syndrome.” Bruce Archibald, manager of OMAFRA’s Environmental Health Program, concurs. “It was a win-win situation, with a shift in thinking on the part of the growers and the government providing resources.”

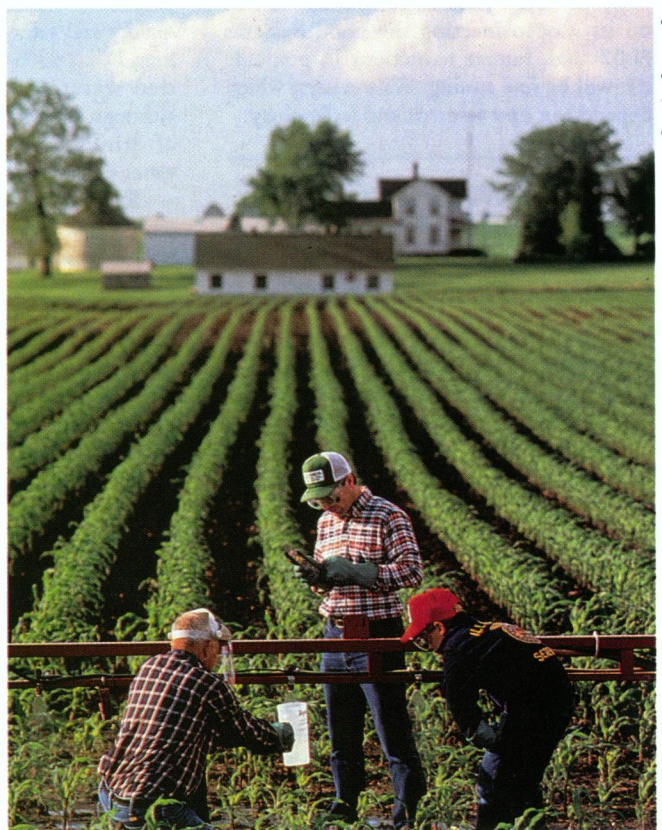
Archibald credits much of Ontario’s reduced pesticide use to the certification

program for purchasing pesticides. Initiated as a voluntary program in 1988, certification became mandatory throughout Ontario in 1991 at the growers’ request. To become certified, growers attend a full-day course on proper label reading, mixing, and applying pesticides, and pass an exam every three years. Before this awareness-raising initiative, said Wilson, farmers applied up to 20% more pesticide to their crops than necessary because of poorly calibrated spraying equipment. In the United States, applying a “restricted use” pesticide requires a license. However, many commonly used pesticides are not restricted, and licensing requirements, developed by each state, vary throughout the country.

Ontario’s certification course also introduces the principles of integrated pest management (IPM), such as crop rotation, mechanical pest removal, use of natural pest predators, and targeted use of pesticides, to help Ontario farmers manage pests more efficiently. During the growing season, farmers using IPM monitor their crops for the appearance of pests or weeds. When pest infestation exceeds a threshold level, the farmer applies a pesticide specifically targeted for that pest. This approach contrasts with traditional methods of applying a broad-spectrum pesticide several times a year.

Wilson, a potato and apple grower, pays \$14 an acre to have scouts monitor his crops for pests. A pesticide specialist provided by OMAFRA sets threshold criteria and advises him on the timing of pesticide applications. Using this service has eliminated two pesticide sprayings per growing season, which, he said, saves money and protects the soil and water from excess toxic chemicals.

In 1993, the Clinton administration set a goal of implementing IPM practices on 75% of U.S. cropland by the year 2000. By the end of the 1993 fiscal year, formal integrated crop management agreements (which integrate IPM with soil conservation and nutrient management) had been implemented between the USDA and 1092 farms, covering 176,000 acres.



Spraying for certain. Properly calibrated spraying equipment helps farmers ensure minimum amounts of pesticides necessary are used.

Although this represents only one-tenth of 1% of the nation’s total cropland, a survey by the U.S. Department of Agriculture indicates that at least some IPM practices are being used on a large portion of the farm acreage in America. The results of this survey, released in September of 1994 in an agricultural information bulletin, show that some form of IPM is being used on 60% of planted acreage of fruits and vegetables and 75–80% of field crop (corn and potato) acreage.

Historically, the USDA taught farmers to use pesticides as an insurance policy for maintaining crop yields. Getting farmers to change their crop protection methods requires re-education, said Betty Marose, an IPM specialist and Maryland Cooperative Extension agent. “A lot can be done if you have the resources for an extension agent to demonstrate these methods,” said Marose, “but it requires time and money.” Unfortunately, funding for IPM education and implementation has remained level for the past 10 years.

Ontario’s pesticide-container recycling program also contributed to reduced pesticide use. When containers are triple-rinsed before recycling, the rinse, containing as much pesticide as 6% of the tank volume, is saved and applied to crops. A similar U.S. program, initiated by pesticide vendors in 1992, now has participation in 45 states.